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## Single Node-based Power Oscillation Detection and Classification

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### Abstract

#### Abstract:

Power oscillation is an ongoing issue for inter-connected grids. The trend towards more inter-connected systems has increased the phenomenon of inter-area oscillations. In it of itself, oscillation frequency is a naturally occurring phenomenon; however, when this particular frequency is continually excited from a disturbance in the system, such as a severe fault or sudden change of the load and generation in the system, the ensuing power oscillation and instability of the system can lead to equipment damage, tripping of tie-lines (load), malfunction of the control and protection system, cascading outages, and collapse of the entire power system, which can lead to a wide-area blackout. In order to eliminate power oscillation, some electric utilities utilize the generator shedding process to maintain the stability of the involved grid. Ideally, the electric utility should capture the full oscillation waveform; however, many utilities only detect for the fundamental value, and components such as harmonics, interharmonics, and subharmonics are often neglected. On the one hand, among various causes, small disturbance signals (i.e. weak signal), such as rotor angular instability, is one of the key components that can lead to power oscillation within an inter-connected grid. A sufficiently high-resolution telemetry data monitoring system — a single node-based for this case study — can detect this type of dynamic information. On the other hand, power oscillation can be categorized into various categories: natural oscillation, transient oscillation, forced oscillation, and ambient oscillation. For this case study, system instability and power oscillation are initially construed as a fully connected k-partite graph; however, in actual operation, as the multivariate color schemas (green denoting "most likely to cause the oscillation" to red denoting "least likely to cause the oscillation") converge, in some cases to the same color schema, a special class of multipartite graph,...

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- III. Oscillation and Instability Mutual Convergence Prototype
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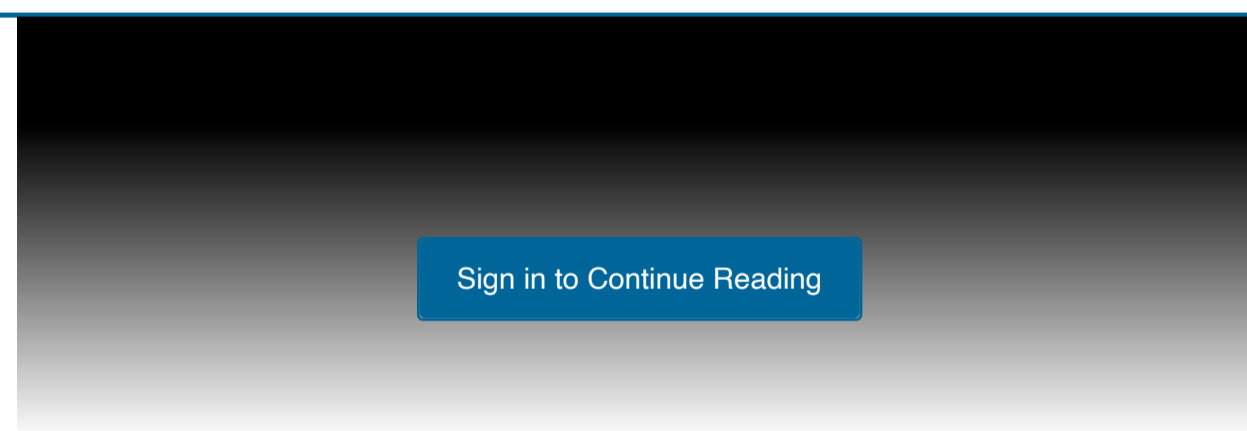
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